

# Claims

- [c1] 1. A variable compression ratio sensing system for an internal combustion engine having a crankshaft and at least one reciprocating piston, with said sensing system comprising:
- a variable compression ratio connecting rod for attaching said crankshaft to said at least one piston, with said connecting rod having a plurality of discrete compression ratio states; and
- a digital output sensor for producing a signal having a value corresponding to the particular compression ratio state of said connecting rod.
- [c2] 2. A variable compression ratio sensing system according to Claim 1, wherein said digital output sensor comprises a Hall Effect sensor.
- [c3] 3. A variable compression ratio sensing system according to Claim 1, wherein said connecting rod has a small end attached to said piston and a large end attached to said crankshaft, with said large end sweeping through a space as said crankshaft rotates, with said space having a boundary which is determined by the compression ratio state of said connecting rod.

- [c4] 4. A variable compression ratio sensing system according to Claim 3, wherein said large end sweeps through an orbit, with said orbit having a radius which is closer to the centerline of said crankshaft when said connecting rod is in a first compression ratio state and farther from the centerline of said crankshaft when said connecting rod is in a second compression ratio state.
- [c5] 5. A variable compression ratio sensing system according to Claim 4, wherein said large end sweeps through an orbit having a radius which is closer to the centerline of said crankshaft when said connecting rod is in a lower compression ratio state and farther from the centerline of said crankshaft when said connecting rod is in a higher compression ratio state.
- [c6] 6. A variable compression ratio sensing system according to Claim 1, wherein said digital output sensor comprises a Hall Effect sensor, with said sensor generating a longer duration signal corresponding to said high compression ratio state and a shorter duration signal corresponding to said low compression ratio state.
- [c7] 7. A variable compression ratio sensing system according to Claim 1, wherein said digital output sensor comprises a Hall Effect sensor, with said sensor generating a

signal having a unique phase with respect to the rotational position of the crankshaft for each compression ratio state.

- [c8] 8. A variable compression ratio sensing system according to Claim 1, wherein said digital output sensor comprises a Hall Effect sensor mounted proximate an end of said connecting rod attached to said crankshaft.
- [c9] 9. An internal combustion engine having a variable compression ratio sensing system, with said engine having a crankshaft with at least one reciprocating piston, and with said sensing system comprising:
- an engine controller;
  - a plurality of engine operating parameter sensors operatively connected with said engine controller, with said sensors including at least a crankshaft position sensor for producing a time-based crankshaft position signal;
  - a connecting rod for attaching said crankshaft to said at least one piston, with said connecting rod having at least one higher compression ratio state and at least one lower compression ratio state; and
  - a digital output sensor for producing a compression ratio signal having a duration corresponding to the compression ratio state of said connecting rod, with said engine controller using said crankshaft position signal and said compression ratio signal to determine the compression

ratio state of said connecting rod.

- [c10] 10. An engine according to Claim 9, wherein said digital output sensor comprises a Hall Effect sensor.
- [c11] 11. An engine according to Claim 9, having a plurality of variable compression ratio connecting rods, with said digital output sensor comprising a Hall Effect sensor positioned proximate a plurality of said connecting rods, so as to generate a longer duration signal in the event that the connecting rods are operating in a higher compression ratio state, with said Hall Effect sensor generating a shorter duration signal in the event that the connecting rods are operating in a lower compression ratio state.
- [c12] 12. An engine according to Claim 9, having a plurality of variable compression ratio connecting rods, with said digital output sensor comprising a Hall Effect sensor positioned proximate a plurality of said connecting rods, so as to generate unique signals corresponding to operation in a higher compression ratio state, operation in a lower compression ratio state, and operation with said connecting rods at mixed compression ratio operating states.
- [c13] 13. A method for determining a compression ratio operating state of a reciprocating internal combustion en-

gine, comprising the steps of:

sensing the operating speed of the engine;

sensing the duration of a compression ratio state signal;

using said sensed operating speed and said sensed compression ratio state signal duration to determine the compression ratio at which the engine is operating.

[c14] 14. A method according to Claim 13, wherein said engine has a variable compression ratio connecting rod and a Hall Effect sensor associated with said connecting rod, with said Hall Effect sensor being placed into proximity to said connecting rod such that the Hall Effect sensor has an output signal with a duration which is dependent upon the compression ratio state of said connecting rod.

[c15] 15. A method according to Claim 14, wherein said Hall Effect sensor is placed proximate a large end of said connecting rod, which is attached to the crankshaft of said engine, with said large end of said connecting rod describing an orbit which shifts according to the particular compression ratio at which said connecting rod is being operated.